ANT CONTROLLERS AND METHOD FOR APPLICATION THEREOF

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to novel ant controller containing a hydrazine derivative as an active ingredient and to a method for application of the ant controller.

RELATED ART

The hydrazine derivatives represented by the formula (I) which can be used as active ingredient of the ant controllers of the present invention are known compounds disclosed in JP-A-5-4958, JP-A-5-17428, JP-A-5-32603, JP-A-5-262712, etc. In these patents, it is described that these derivatives have an insecticidal activity as agrihorticultuarl insecticides against LEPIDOPTERA such as diamondback moth, rice leafroller, etc., HEMIPTERA such as tea green leafhopper, pear lace bug, etc., COLEOPTERA such as twenty-eight-spotted ladybird, maize weevil, etc., DIPTERA such as melon fly, house fly, house mosquito, etc., and TYLENCHIDA such as coffee root-lesion nematode, root-knot nematode, etc.

Any of these patent gazettes, however, does neither describe nor suggest that said hydrazine derivatives have a marked insecticidal effect against

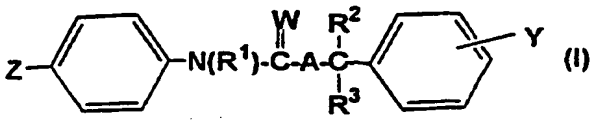
ISOPTERA such as formosan subterranean termite, kolbe, etc., HYMENOPTERA such as cabbage sawfly, Carpenter ant, etc., ORTHOPTERA such as Japanese cockroach, field cricket, rice grasshopper, etc., and PSOCOPTERA such as large pale booklouse, etc.

SUMMARY OF THE INVENTION

The present inventors have conducted extensive studies with the aim of creating a novel ant controller having a marked controlling effect upon ants doing harm to the wooden materials constituting houses, furniture, etc. or crops and human being. As a result, it has been found that some of the hydrazine derivatives described in the above-mentioned prior art have a marked insecticidal effect upon termites and ants. The present invention has been accomplished on the basis of this findings.

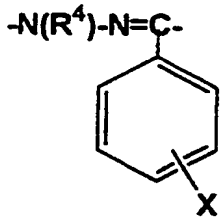
DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to ant controllers containing as active ingredient thereof a hydrazine derivative represented by the following formula (I) and method for application of the ant controllers:

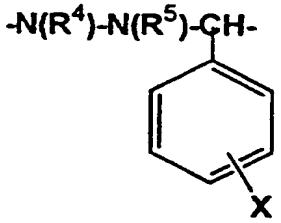


(I)

wherein A represents:

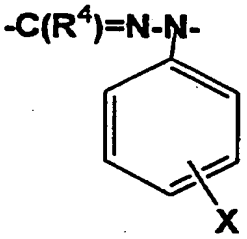


(wherein R^4 represents hydrogen atom or C_1-C_6 alkyl group, and X represents 1 to 5, same or different substituents selected from the group consisting of hydrogen atom, halogen atom, C_1-C_6 alkyl group and halo C_1-C_6 alkyl group),

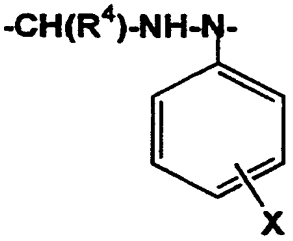


(

wherein R^4 and X are as defined above, and R^5 represents hydrogen atom, C_1-C_6 alkylcarbonyl group or phenylcarbonyl group which may have 1 to 2, same or different substituents selected from the group consisting of C_1-C_6 alkyl groups),



(wherein R^4 and X are as defined above), or



(wherein R^4 and X are as defined above);

R^1 represents hydrogen atom or C_1-C_6 alkyl group;

R^2 and R^3, which may be same or different, represent hydrogen atom, hydroxyl group, C_1-C_6 alkyl group, C_1-C_6 alkoxy group, C_1-C_6 alkylcarbonyl group or phenylcarbonyl group;

Y represents 1 to 5, same or different substituents selected from the group consisting of hydrogen atom, halogen atom, nitro group and cyano group;

Z represents halogen atom, cyano group, C_1-C_6 alkyl group, halo C_1-C_6 alkyl group, C_1-C_6 alkoxy group, halo C_1-C_6 alkoxy group, halo C_1-C_6 alkylthio group, halo C_1-C_6 alkylsulfinyl group or halo C_1-C_6 alkylsulfonyl group; and

W represents oxygen atom or sulfur atom.

The ant controller of the present invention is an excellent ant controller for protecting wooden materials such as trees, board fences, sleepers, etc. and buildings such as shrines, temples, houses, outhouses, factories, etc. from ants such as termites, and for controlling ants doing harm to crops or human being.

In the definition of the formula (I) shown above, the term "halogen atom" means chlorine atom, bromine atom, iodine atom and fluorine atom; the term "C_1-C_6 alkyl" means a straight or branched chain alkyl group having 1 to 6 carbon atoms; and the term "halo C_1-C_6 alkyl" means an alkyl group having 1 to 6 carbon atoms substituted with at least one, same or different halogen atoms.

Preferable examples of the hydrazine derivative represented by the formula (I) of the present invention are the hydrazine derivatives represented by the formulas (I-1) and (I-2) as mentioned below. Preferable examples of each substituent of the hydrazine derivatives of formulas (I-1) and (I-2) are the compounds wherein W is oxygen atom, X is trifluoromethyl group, Y is cyano group, Z is trifluoromethoxy group, and each of R^1, R^2, R^3 and R^4 is simultaneously a hydrogen atom. More preferable examples are the compounds wherein X is substituted on the 3-position, and Y is substituted on the 4-position of the phenyl ring.

Most preferable example is the hydrazine derivative represented by the formula (I-1), wherein each of R^1, R^2, R^3 and R^4 is simultaneously a hydrogen atom, X is trifluoromethyl group substituted on the 3-position of the phenyl ring, Y is cyano group substituted on the 4-position of the phenyl ring, and Z is trifluoromethoxy group.

Typical examples of the hydrazine derivative

represented by the formula (I) used as an active ingredient of the ant controller of the present invention are shown in Table 1 to Table 4, but the present invention is by no means limited to the compounds exemplified herein.

Formula (I-1)

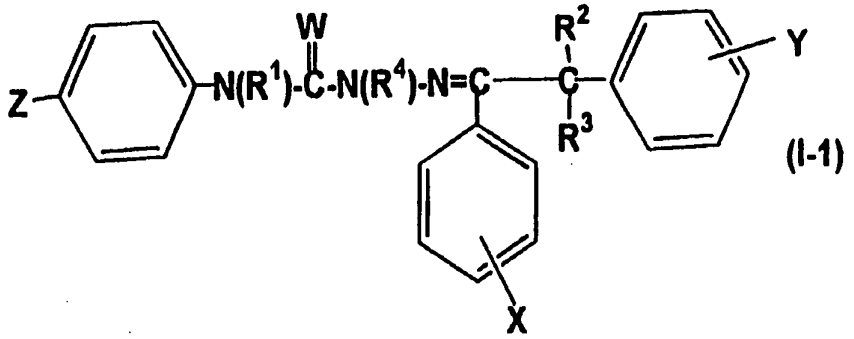


Table 1

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp (°)
1	H	H	H	H	H	H	Cl	O	199
2	H	H	H	H	H	H	OCF_3	O	149
3	H	H	H	H	H	4-Cl	Cl	O	206
4	H	H	H	H	H	4-Cl	OCF_3	O	197
5	H	H	H	H	H	4-CN	Cl	O	217
6	H	H	H	H	H	4-CN	Cl	S	128
7	H	H	H	H	H	4-CN	OCF_3	S	116

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp °C
8	H	H	H	H	H	4-CN	OCF_3	O	214 E-form
9	H	H	H	H	H	4-CN	OCF_3	O	159 Z-form
10	H	H	H	H	H	4-NO_2	Cl	O	222
11	H	H	H	H	H	4-NO_2	Cl	S	206
12	H	H	H	H	H	4-NO_2	OCF_3	O	189
13	H	H	H	H	H	4-NO_2	OCF_3	S	139
14	H	H	H	H	H	4-NO_2	SCF_3	O	200
15	H	H	H	H	3-Cl	H	OCF_3	O	212
16	H	H	H	H	3-Cl	4-Cl	OCF_3	O	201
17	H	H	H	H	3-Cl	4-CN	Cl	O	206

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp □
18	H	H	H	H	3-Cl	4-CN	OCF_3	O	187 E-form
19	H	H	H	H	3-Cl	4-CN	OCF_3	O	148 Z-form
20	H	H	H	H	3-Cl	4-CN	OCF_3	S	199
21	H	H	H	H	3-Cl	4-CN	SCF_3	O	215
22	H	H	H	H	3-Cl	4-CN	$SOCF_3$	O	205
23	H	H	H	H	3-Cl	4-CN	SO_2CF_3	O	212
24	H	H	H	H	3-Br	H	Cl	O	191
25	H	H	H	H	3-Br	H	OCF_3	O	209
26	H	H	H	H	3-Br	4-CN	Cl	O	205
27	H	H	H	H	3-Br	4-CN	OCF_3	O	176
28	H	H	H	H	3-Br	4-CN	SCF_3	O	206

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp □
29	H	H	H	H	3-Br	4-CN	$SOCF_3$	O	216
30	H	H	H	H	3-Br	4-CN	SO_2CF_3	O	215
31	H	H	H	H	3-F	H	Cl	O	206
32	H	H	H	H	3-F	H	OCF_3	O	200
33	H	H	H	H	3-F	4-Cl	OCF_3	O	191
34	H	H	H	H	3-F	4-Cl	Cl	O	208
35	H	H	H	H	3-F	4-CN	OCF_3	O	202
36	H	H	H	H	3-I	4-CN	Cl	O	213
37	H	H	H	H	3-I	4-CN	OCF_3	O	201
38	H	H	H	H	$3-CH_3$	H	Cl	O	185
39	H	H	H	H	$3-CH_3$	H	OCF_3	O	198
40	H	H	H	H	$3-CH_3$	4-CN	Cl	O	200
41	H	H	H	H	$3-CH_3$	4-CN	OCF_3	O	189

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp □
42	H	H	H	H	3-CF_3	H	Cl	O	206
43	H	H	H	H	3-CF_3	H	OCF_3	O	210
44	H	H	H	H	3-CF_3	4-CN	OCF_3	O	191
45	H	H	H	H	3-CF_3	4-CN	OCF_3	S	149
46	CH_3	H	H	H	H	H	Cl	O	132
47	CH_3	H	H	H	H	H	OCF_3	O	108
48	H	CH_3	H	H	H	H	Cl	O	98
49	H	CH_3	H	H	H	H	Br	O	85
50	H	CH_3	H	H	H	H	OCF_3	O	115 EZ-form
51	H	CH_3	H	H	H	H	OCF_3	O	95 E-form
52	H	CH_3	H	H	H	H	OCF_3	O	66 Z-form

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp []
53	H	CH_3	H	H	H	4-Cl	Cl	O	121
54	H	CH_3	H	H	H	4-Cl	OCF_3	O	105
55	H	CH_3	H	H	3-Cl	4-CN	Cl	O	140
56	H	CH_3	H	H	3-Cl	4-CN	OCF_3	O	98
57	H	H	OH	H	H	H	Cl	O	188
58	H	H	OH	H	H	H	OCF_3	O	170
59	H	H	OH	H	H	4-Cl	Cl	O	Viscous
60	H	H	OH	H	H	4-Cl	OCF_3	O	185 E-form
61	H	H	OH	H	H	4-Cl	OCF_3	O	95 Z-form
62	H	H	OH	H	H	4-CN	Cl	O	Viscous
63	H	H	OH	H	H	4-CN	OCF_3	O	113
64	H	H	CH_3	H	H	H	Cl	O	164
65	H	H	CH_3	H	H	H	OCF_3	S	118

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp □
66	H	H	OCH_3	H	H	H	Cl	O	183
67	H	H	OCH_3	H	H	H	OCF_3	O	181
68	H	H	OC_3H_7-i	H	H	H	Cl	O	155
69	H	H	OC_3H_7-i	H	H	H	OCF_3	O	193
70	H	H	OC_4H_9-i	H	H	H	Cl	O	176
71	H	H	OC_4H_9-i	H	H	H	OCF_3	O	184
72	H	H	O-CO-CH_3	H	H	H	OCF_3	O	182
73	H	H	O-CO-Ph	H	H	H	OCF_3	O	168
74	H	H	OH	CH_3	H	H	Cl	O	115
75	H	H	OH	CH_3	H	H	OCF_3	O	130
76	H	H	H	H	3-F	4-CN	SCF_3	O	214
77	H	H	H	H	3-F	4-CN	$SOCF_3$	O	214
78	H	H	H	H	4-F	4-CN	SO_2CF_3	O	165
79	H	H	H	H	3-Cl	4-CN	$SOCF_3$	O	157

Table 1 (Cont'd)

No.	R^1	R^2	R^3	R^4	X	Y	Z	W	mp □
80	H	H	H	H	3-CF_3	4-CN	SCF_3	O	215
81	H	H	H	H	3-CF_3	4-CN	$SOCF_3$	O	210
82	H	H	H	H	3-CF_3	4-CN	OCF_3	O	152 Z-form
83	H	H	H	H	3-CF_3	4-CN	Cl	O	165

Note: Ph is phenyl group.

Formula (I-2)

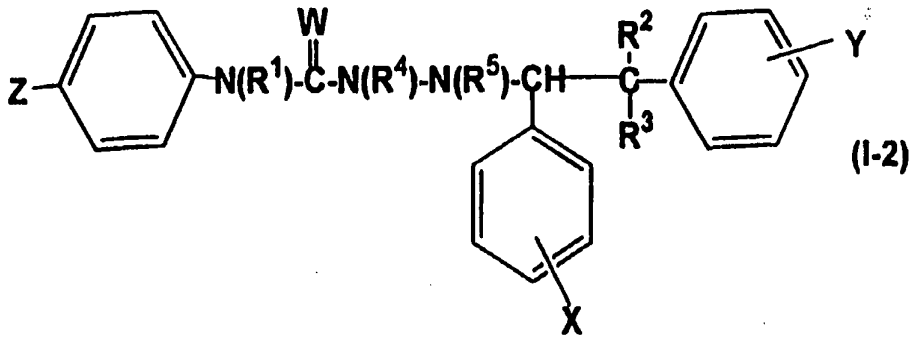


Table 2 (R^1 and R^3 are hydrogen atoms)

No.	R^2	R^4	R^5	X	Y	Z	W	mp []
84	H	H	H	H	H	Cl	O	211
85	H	H	H	H	H	OCF_3	O	194
86	H	H	H	H	4-Cl	OCF_3	O	209
87	H	H	H	H	4-CN	OCF_3	O	204
88	H	H	H	H	4-NO_2	OCF_3	O	203
89	H	H	H	3-F	4-Cl	OCF_3	O	203
90	H	H	H	3-Cl	4-Cl	OCF_3	O	176

Table 2 (Cont'd)

No.	R^2	R^4	R^5	X	Y	Z	W	mp []
91	H	H	H	3-Cl	4-CN	OCF_3	O	193
92	H	H	H	3-Cl	4-CN	SCF_3	O	177
93	H	H	H	3-Cl	4-CN	$SOCF_3$	O	178
94	H	H	H	3-Cl	4-CN	SO_2CF_3	O	170
95	H	H	H	3-Br	4-CN	OCF_3	O	187
96	H	H	H	3-CF_3	4-CN	OCF_3	O	165
97	H	H	H	3-CF_3	4-CN	SCF_3	O	164
98	H	H	H	H	4-Cl	OCF_3	S	171
99	H	H	H	3-Cl	4-CN	OCF_3	S	149
100	H	H	H	3-CF_3	4-CN	OCF_3	S	209
101	H	H	CO-CH_3	3-Cl	4-CN	OCF_3	O	178
102	H	H	CO-Ph	3-Cl	4-CN	OCF_3	O	221

Table 2 (Cont'd)

No.	R^2	R^4	R^5	X	Y	Z	W	mp (°)
103	H	H	$CONHC_2H_5$	3-Cl	4-CN	OCF_3	O	201
104	H	OH	H	H	H	OCF_3	O	190
105	H	OCH_3	H	H	H	Cl	O	195
106	H	OCH_3	H	H	H	OCF_3	O	183
107	H	OCH_3	H	H	H	OCF_3	O	186
108	CH_3	H	H	3-Cl	4-CN	OCF_3	O	156
109	H	H	H	H	4-F	OCF_3	O	209
110	H	H	H	H	4-Br	Cl	O	233
111	H	H	H	H	4-Br	OCF_3	O	201
112	H	H	H	H	3-CN	OCF_3	O	176
113	H	H	H	H	$2-NO_2$	OCF_3	O	197
114	H	H	H	3-F	4-CN	OCF_3	O	189

Table 2 (Cont'd)

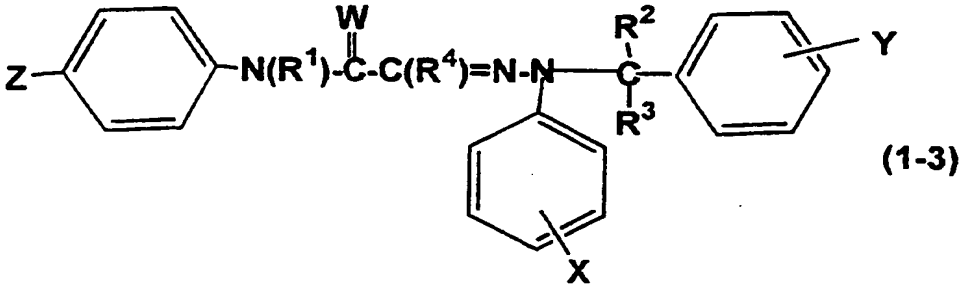
No.	R^2	R^4	R^5	X	Y	Z	W	mp []
115	H	H	H	3-F	4-CN	SCF_3	O	189
116	H	H	H	3-F	4-CN	$SOCF_3$	O	166
117	H	H	H	3-CF_3	4-CN	OCF_3	O	131 (-)-Isomer
118	H	H	H	3-CF_3	4-CN	OCF_3	O	126 (+)-Isomer
119	H	H	H	3-CF_3	4-CN	$SOCF_3$	O	Glassy
120	H	H	H	3-CF_3	4-CN	SO_2CF_3	O	Glassy
121	H	H	H	H	3-CN	OCF_3	O	120

Note: Ph is phenyl group.

Compounds 106 and 107 are diasteromers.

Compound 106 is higher than Compound 107 in the Rf value.

Formula (I-3)



(1-3)

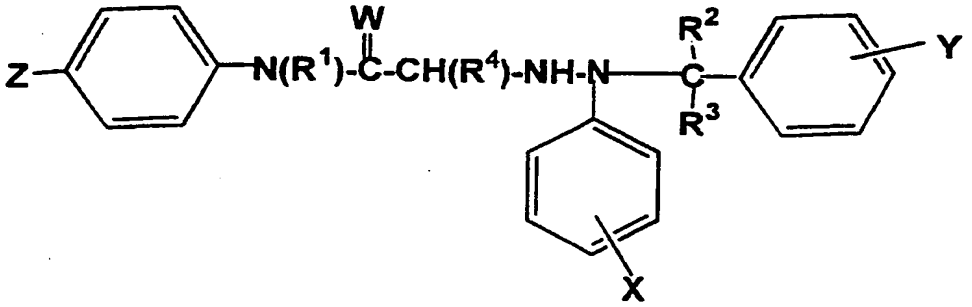
Table 3 (R^2 and R^3 are hydrogen atoms, and W is oxygen atom.)

No	R^1	R^4	X	Y	Z	mp □, Refractive index
122	H	H	H	H	OCF_3	113.3-114.0
123	H	H	H	4-Cl	OCF_3	137.8
124	H	H	H	4-CN	Cl	163
125	H	H	H	4-CN	OCF_3	138
126	H	H	3-Cl	4-Cl	Cl	143.5-144.0
127	H	H	3-Cl	4-Cl	OCF_3	139.6-141.5
128	H	H	3-Cl	$4-NO_2$	Cl	174.0-176.5
129	H	H	3-Cl	$4-NO_2$	OCF_3	151.6-151.7
130	H	H	3-Cl	4-CN	Cl	191.0-192.0
131	H	H	3-Cl	4-CN	OCF_3	160.5-162.0
132	H	H	3-Cl	4-CN	SCF_3	188.0
133	H	H	3-Cl	4-CN	$SOCF_3$	206.1
134	H	H	3-F	4-CN	Cl	154-156
135	H	H	3-F	4-CN	OCF_2	155.9-156.8

Table 3 (Cont'd)

No	R^1	R^4	X	Y	Z	mp □, Refractive index
136	H	H	3-CH_3	4-CN	Cl	127
137	H	H	3-CH_3	4-CN	OCF_3	166
138	H	H	3-CF_3	4-CN	Cl	164-165
139	H	H	3-CF_3	4-CN	OCF_3	151.0
140	H	CH_3	3-Cl	4-CN	OCF_3	nD 1.5950 (25□□
141	CH_3	H	3-CF_3	4-CN	Cl	209-211
142	H	H	3-Cl	2-CN	OCF_3	148

Formula (I-4)



(1-4)

Table 4 (R^1, R^2, R^3 and R^4 are hydrogen atoms.)

No	X	Y	Z	mp □, Refractive index
143	H	H	OCF_3	51.0-53.0
144	H	4-Cl	OCF_3	92.1
145	H	4-CN	Cl	106-108
146	H	4-CN	OCF_3	nD 1.5685 (27□)
147	3-Cl	4-Cl	Cl	105.3-106.4
148	3-Cl	4-Cl	OCF_3	38.0
149	3-Cl	4-NO_2	Cl	Viscous
150	3-Cl	4-NO_2	OCF_3	Viscous
151	3-Cl	4-CN	Cl	153.1
152	3-Cl	4-CN	OCF_3	43.5-45.0
153	3-F	4-CN	Cl	164-165
154	3-F	4-CN	OCF_3	nD 1.5615 (27□)
155	3-CH_3	4-CN	Cl	138-139
156	3-CH_3	4-CN	OCF_3	nD 1.5315 (28□)
157	3-CF_3	4-CN	Cl	43
158	3-CF_3	4-CN	OCF_3	153.1

Some of the compounds shown in Tables 1 to 4 are viscous or glassy substances. Their ^{1}H-NMR data are summarized in Table 5.

Table 5

No	^{1}H-NMR[$CDCl_3$/TMS, δ (ppm)]
59	6.29 (s, 1H), 7.65-7.92 (m, 13H), 9.14 (bs, 1H), 10.70 (bs, 1H). (DMSO-d_6)
62	3.88 (bs, 1H), 3.87 (s, 1H), 6.91-7.55 (m, 13H), 7.73 (s, 1H), 8.13 (bs, 1H).
119	3.12 (dd, 1H), 3.23 (dd, 1H), 4.12-4.32 (m, 2H), 6.13 (bs, 1H), 7.24-7.93 (m, 12H), 8.08 (bs, 1H).
120	3.11 (dd, 1H), 3.23 (dd, 1H), 4.13-4.28 (m, 2H), 5.97 (s, 1H), 7.25-7.75 (m, 12H), 7.90-8.00 (bs, 1H).
149	3.65 (d, 2H), 4.20 (t, 1H), 4.70 (s, 2H), 6.85 (dd, 1H), 6.93 (dd, 1H), 7.08 (dd, 1H), 7.15-7.21 (m, 3H), 7.24 (d, 2H), 7.40 (d, 2H), 8.13 (d, 2H), 8.40 (s, 1H).
150	3.64 (s, 2H), 4.69 (s, 2H), 6.84 (dd, 1H), 6.94 (dd, 1H), 7.09 (m, 3H), 7.23 (t, 1H), 7.29 (d, 2H), 7.40 (d, 2H), 8.12 (d, 2H), 8.40 (s, 1H).

The ant controller of the present invention exhibits a markedly high killing effect at a low dosage upon all the termites doing harm to houses, construction materials, furniture, leathers, fibers, vinyl articles, electric wires and cables, for example, RHINOTERMITIDAE including Coptotermes formosanus Shiraki, Reticulitermes speratus (Kolbe), Reticulitermes hesperus which inhabits the North America, Reticulitermes tibialis, Reticulitermes flavipes, Reticulitermes lucifugus which inhabits the shore of the Mediterranean, Reticulitermes santonensis, Incisitermes minor (Hagen), TERMITIDAE including Odontotermes formosanus (Shiraki), KALOTERMITIDAE including Cryptotermes domesticus (Haviland), TERMOPSIDAE including Hodotermopsis japonica (Holmgren), etc.

Further, the ant controller of the present invention exhibits a markedly high killing effect at a low dosage upon all the ants doing harm to crops, or to human being when the ants invade into houses and public facilities such as parks, for example, FORMICIDAE including Monomorium pharaonis Linne, Monomorium nipponense Wheelex, Camponotus kiusiuensis Santschi, Formica japonica Motschulsky, Lasius fuliginosus (Latreille), Solenopsis richteri, Solenopsis invicta, Solenopsis geminata (Fireant), etc.

For using the ant controller of the present invention containing the hydrazine derivative of formula (I) as an active ingredient efficiently, the ant

controller is formulated with a proper solid carrier and/or liquid carrier. If necessary, it is formulated with auxiliaries in a proper proportion according to the conventional recipe of formulation, and homogenized together with the carrier by the method of dissolution, suspension, mixing, impregnation, adsorption or adhesion, so as to be made it into an appropriate preparation form such as oily solution, emulsifiable concentrate, solubilized concentrate, dust, granule, wettable powder, aerosol, fumigant, flowable preparation or the like. It is also possible to form the termite controller into a bait preparation by compounding it with a bait containing an attractant or the like.

As the solid carrier used in the present invention, there can be exemplified clays such as kaolin, bentonite, acid clay and the like; talcs such as talc, pyrophillite and the like; silica materials such as diatomaceous earth, siliceous sand, mica, synthetic silicate, synthetic high-dispersion silica and the like; and inorganic mineral powders such as pumice, sand and the like; organic matters such as pieces of wood, chips of pulp wood, grain flour, sugars and the like. As the liquid carrier, there can be exemplified alcohols such as methyl alcohol, ethyl alcohol, ethylene glycol and the like; ketones such as acetone, methyl ethyl ketone, cyclohexanone and the like; ethers such as ethyl ether, dioxane, tetrahydrofuran, Cellosolves and the like; aliphatic hydrocarbons such as light oil, kerosene and

the like; aromatic hydrocarbons such as benzene, toluene, xylene, solvent naphtha, cyclohexanone, methylnaphthalene and the like; and halogenated hydrocarbons such as chloroform, carbon tetrachloride, chlorobenzene and the like. These solid and liquid carriers may be used either alone or in the form of a mixture.

As the auxiliaries which can be used in the present invention, surfactants, dispersants, sticking agents, etc. can be referred to. As the surfactants, there can be exemplified polyoxyethylene alkylaryl ethers, polyoxyethylene sorbitan monolaurates, alkylaryl sorbitan monolaurates, alkylbenzesulfonates, alkylnaphthalene-sulfonates, ligninsulfonates, higher alcohol sulfuric ester salts, etc. These surfactants may be used either alone or in the form of a mixture.

As the dispersants or sticking agents, for example, casein, gelatin, starch, alginic acid, carboxymethyl cellulose, agar, polyvinyl alcohol, turpentine oil, etc. can be used according to the need.

The ant controller of the present invention is applied not only to the surrounding soil surface or into the under-floor soil in order to protect wooden materials such as trees, board fences, sleepers, etc. and structures such as shrines, temples, houses, outhouses, factories, etc., but it can also be applied to lumbered articles such as surfaces of the under-floor concrete, alcove posts, beams, plywoods, furniture,

etc., wooden articles such as particle boards, half boards, etc. and vinyl articles such as coated electric wires, vinyl sheets, heat insulating material such as styrene foams, etc. In case of application against ants doing harm to crops or human beings, the ant controller of the present invention is applied to the crops or the surrounding soil, or is directly applied to the nest of ants or the like.

The present invention is not limited to the embodiments mentioned above, but it also includes the embodiments of applying the ant controller of the invention preventively to places at which occurrence of ants is expected.

In putting the ant controller of the present invention, the dosage may be appropriately selected from the ranges properly chosen. In case of application to wooden materials, the quantity of active ingredient ranges from 0.1 to 50 g per m^2; and in case of soil treatment or application to the nests, the quantity of active ingredient ranges from 1 to 500 g per m^2.

EXAMPLES

Next, typical examples and test example of the present invention are presented below. The invention is by no means limited to these examples.

In the examples, "parts" are by weight.

Formulation Example 1

Each hydrazine derivative listed in Tables 1-4	20 parts
Xylene	80 parts

The ingredients mentioned above were made into a uniform solution to obtain an oily solution.

Formulation Example 2

Each hydrazine derivative listed in Tables 1-4	10 parts
Polyoxyethylene styrylphenyl ether	10 parts
Cyclohexanone	80 parts

The ingredients mentioned above were uniformly mixed and dissolved together to obtain an emulsifiable concentrate.

Formulation Example 3

Each hydrazine derivative listed in Tables 1-4	10 parts
Sodium alkylbenzenesulfonate	2 parts
White carbon	10 parts
Clay	78 parts

The ingredients mentioned above were uniformly mixed and pulverized to obtain a wettable powder.

Formulation Example 4

Each hydrazine derivative listed in Tables 1-4	8 parts

Cyclohexanone 4 parts

Mixture of polyoxyethylene nonylphenyl ether and alkylbenzenesulfonic acid 3 parts

A granular composition was prepared by uniformly mixing and dissolving together the ingredients mentioned above, and spraying the resulting solution onto 85 parts of granular pumice, followed by drying.

Test Example 1

A filter paper was spread in a glass dish having a diameter of 9 cm, onto which was dropped 1 ml of a 500 ppm solution of the ant controller of the present invention. Then, the filter paper was inoculated with Coptotermes formosanus Shiraki. Seven days after the inoculation, percentage of dead insects was investigated, from which mortality was calculated. The results were evaluated according to the following criterion. The test was carried out with triplicate group of 10 insects.

Criterion	Mortality (%)
A	100
B	99-90
C	89-80
D	79-50

The results are summarized in Table 6.

Table 6

Compound No.	Termite-killing effect	Compound No.	Termite-killing effect
1	A	5	A
2	B	6	A
3	A	7	A
4	A	8	C

Table 6 (Cont'd)

Compound No.	Termite-killing effect	Compound No.	Termite-killing effect
9	B	32	A
10	A	33	C
11	A	34	A
12	A	35	A
13	A	36	B
14	A	37	A
15	B	38	B
16	C	39	A
17	A	40	D
18	A	41	A
19	A	42	A
20	A	43	A
21	A	44	C
22	B	45	A
23	A	46	A
24	C	47	A
25	D	48	A
26	A	49	C
27	A	50	A
28	C	51	A
29	C	52	A
30	A	53	B
31	A	54	A

Table 6 (Cont'd)

Compound No.	Termite-killing effect	Compound No.	Termite-killing effect
55	A	78	A
56	A	79	B
57	D	80	A
58	A	81	A
59	C	82	B
60	C	83	D
61	A	84	A
62	A	85	C
63	A	86	A
64	A	87	C
65	C	88	A
66	A	89	B
67	A	90	A
68	A	91	A
69	B	92	A
70	A	93	D
71	A	94	A
72	A	95	A
73	A	96	A
74	A	97	A
75	A	98	A
76	A	99	A
77	A	100	A

Table 6 (Cont'd)

Compound No.	Termite-killing effect	Compound No.	Termite-killing effect
101	A	124	D
102	A	125	A
103	A	126	A
104	A	127	A
105	B	128	A
106	A	129	A
107	D	130	C
108	C	131	C
109	C	132	A
110	B	133	A
111	D	134	A
112	A	135	B
113	A	136	A
114	B	137	A
115	A	138	A
116	B	139	A
117	A	140	A
118	D	141	D
119	A	142	C
120	A	143	C
121	C	144	B
122	D	145	A
123	A	146	D

Table 6 (Cont'd)

Compound No.	Termite-killing effect	Compound No.	Termite-killing effect
147	A	153	A
148	A	154	B
149	A	155	A
150	C	156	B
151	C	157	A
152	B	158	C

Test Example 2

The ant controller of the present invention was applied to nests (anthill) of fireant (Solenopsis geminata) with drench treatment, in terms of 1 g of the active ingredient per one nest. 14 Days after the treatment of the ant controller, the activity of the nests was evaluated according to the following criterion. The test was carried out with one block per one nest.

Criterion	Effect
A	Nest is completely destructed or activity of the nest is extremely low.
B	Activity of the nest is exhibited.
C	High activity of the nest is exhibited.
D	Activity of the nest is extremely high.

As a result of the test, compound Nos. 44 and 96 of the present invention exhibited the effect "A".